

Notice of Allowance dated 1-30-2004

Appl. No. 10/018,989

Amdt. dated 02-09-2004

Attorney Docket No. 1217-012124

AMENDMENTS TO THE SPECIFICATION

Please amend the title as follows:

--Tableware and Method for Surface Treatment Thereof, Substrate Having Hard Decorative Coating Film and Method for Production Thereof, and Cutlery --

Please replace the paragraph beginning at page 4, line 1, with the following rewritten paragraph:

-- The substrates having such hard coating films have gold color tone and are not marred easily. The hard coating film, however, is a thin film of usually about 1 μm , so that if a strong force is applied to the coating film surface, the material may be deformed to produce irregularities on the substrate surface despite intactness of the coating film. If the irregularities are extreme, the coating film may separate off because of the internal stress. --

Please replace the paragraph beginning at page 6, line 1, with the following rewritten paragraph:

-- Moreover, the cutlery sinks to the bottom of the washing tub, being brought into contact with dirty things deposited on the bottom, which is very insanitary unsanitary. --

Please replace the paragraph beginning at page 12, line 20, with the following rewritten paragraph:

-- In the internal hardened layer, it is preferable that 0.6 to 8.0% by weight of nitrogen and 1.0 to 14.0% by weight of oxygen are diffused so as to form a solid solution in the first hardened layer and 0.5 to 14.0% by weight of oxygen is diffused so as to form a solid solution in the seconded second hardened layer. --

Please replace the paragraph beginning at page 24, line 18, with the following rewritten paragraph:

-- As shown in Fig. 2, on a surface of titanium or titanium alloy tableware (referred to as "titanium tableware" hereinafter) 100, a surface hardened layer 101 is formed. The surface hardened layer 101 is spread to a depth of about 20 μm from

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the surface. The surface hardened layer 101 is divided into a first hardened layer 102 in which nitrogen 104 and oxygen 105 are diffused so as to form a solid solution and a second hardened layer 103 in which oxygen 105 is diffused so as to form a solid solution. The first hardened layer 102 is observed to extend to the region of a depth of about 1 μm from the surface, and in the region deeper than this, the second hardened layer 103 is present. The first hardened layer 102 in which nitrogen 104 and oxygen 105 are diffused so as to form a solid solution has a particularly high hardness and has a function of preventing marring of the member surface. The second hardened layer 103 spreads its hardened range to the deep portion of the member and has a function of enhancing impact resistance.--

Please replace the paragraph beginning at page 37, line 6, with the following rewritten paragraph:

-- As shown in Table 1, after the surface treatment, the sample number S1 (treating temperature: 650°C) had an average surface roughness Ra and a crystal grain size Rc equivalent to those of the untreated pure titanium tableware (sample number Sc) and retained good appearance quality. However, it showed a low Vickers hardness Hv of 380 at a depth of 1.0 μm from the surface. The nitrogen content in the same depth portion of this sample was measured and found to be 0.05% by weight, which indicated that nitrogen was rarely contained. That is, it can be seen that the first hardened layer 102 shown in Fig. 2 was not formed. The oxygen content in the 20 μm depth portion from the surface was 0.01% by weight, showing that the second hardened layer 103 was not formed either. --.

Please replace the paragraph beginning at page 65, line 10, with the following rewritten paragraph:

-- In the above-mentioned each embodiment, further, the treating time of the hardening treatment step was 5 hours, but the treating time is not restricted thereto, and it may be arbitrarily determined. However, if the treating time of the hardening treatment step is shorten than 1 hour, diffusion of nitrogen and oxygen so as to form a solid solution ~~do~~ does not proceed sufficiently, and there is a fear that necessary

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hardness is not obtained. On the other hand, if the treating time of the hardening treatment step is longer than 10 hours, surface roughening is liable to occur on the titanium tableware. Therefore, the treating time of the hardening treatment step is preferably in the range of 1 to 10 hours. --

Please replace the paragraph beginning at page 113, line 17, with the following rewritten paragraph:

-- In contrast, the sample numbers S22 and S23 had a sufficiently high Vickers hardness Hv of 840 to 1050 at a depth of 1.0 μm from the surface, an average surface roughness Ra of 0.25 to 0.35 μm and a crystal grain size Rc of 30 to 60 μm , retaining good appearance quality equivalent to that of the untreated pure titanium substrate (sample number Sc). In the sample numbers SW22 and S23, the nitrogen content and the oxygen content in the 1.0 μm depth portion from the surface were 0.6 to 8.0% by weight and 1.0 to 14.0% by weight, respectively, similarly similar to the titanium substrate of the sample numbers S2 and S3 in Table 8. Presumably, the first hardened layer 102 shown in Fig. 17 has been formed. --

Please replace the paragraph beginning at page 114, line 3, with the following rewritten paragraph:

-- Since the oxygen content in the 20 μm depth portion from the surface was 0.5 to 14.0% by weight, presumably the second hardened layer 103 shown in Fig. 17 has been also formed. Thus, a titanium substrate having an internal hardened layer was obtained. The substrates of the sample numbers S22 and S23 retained mirror surface quality equivalent to that of the substrate prior to the surface hardening treatment. Then, as the inert gas to be introduced into the vacuum chamber 1 in the hardening treatment step, a helium gas was used, and equivalent results were obtained. The heating step and the hardening treatment step were carried out with by variously changing the treating temperature in the temperature range of 650 to 830°C, similarly similar to the second embodiment. Thereafter, hardness, surface roughening, and size of crystal grain in the surface structure were measured and

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evaluated. The results obtained when a helium gas was used as the inert gas are set forth in Table 14. --

Please replace the paragraph beginning at page 116, line 17, with the following rewritten paragraph:

-- In contrast, the sample numbers S26 and S27 had a sufficiently high Vickers hardness Hv of 780 to 840 at a depth of 1.0 μm from the surface, an average surface roughness Ra of 0.25 to 0.3 μm and a crystal grain size Rc of 30 to 60 μm , retaining good appearance quality equivalent to that of the untreated pure titanium substrate (sample number Sc). In the sample numbers S26 and S27, the nitrogen content and the oxygen content in the 1.0 μm depth portion from the surface were 0.6 to 8.0% by weight and 1.0 to 14.0% by weight, respectively, similarly similar to the substrates of the sample numbers S2 and S3 in Table 8. Presumably, the first hardened layer 102 shown in Fig. 17 has been formed. --

Please replace the paragraph beginning at page 117, line 6, with the following rewritten paragraph:

-- In this embodiment, the heating step was achieved in an argon atmosphere at atmospheric pressure or in a helium atmosphere at atmospheric pressure, but the atmosphere is not necessarily restricted to these ones, and the heating step may be carried out under vacuum. --

Please replace the paragraph beginning at page 117, line 11, with the following rewritten paragraph:

-- In this embodiment, the cooling step was carried out in an argon atmosphere at atmospheric pressure or in a helium atmosphere at atmospheric pressure, but the atmosphere is not necessarily restricted to these ones, and the cooling step may be carried out under vacuum. --

Please replace the paragraph beginning at page 118, line 10, with the following rewritten paragraph:

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-- In the above-mentioned each embodiment, further, the treating time of the hardening treatment step was 5 hours, but the treating time is not restricted thereto, and it may be arbitrarily determined. However, if the treating time of the hardening treatment step is shorter than 1 hour, diffusion of nitrogen and oxygen so as to form a solid solution ~~do~~ does not proceed sufficiently, and there is a fear that necessary hardness is not obtained. On the other hand, if the treating time of the hardening step is longer than 10 hours, surface roughening is liable to occur on the titanium tableware. Therefore, the treating time of the hardening treatment step is preferably in the range of 1 to 10 hours. --

Please replace the paragraph beginning at page 123, line 26, with the following rewritten paragraph:

-- First, the portable radio body having the internal hardened layer 101 was washed with an organic solvent such as isopropyl alcohol and placed in ~~an~~ a vacuum device. Using a high-frequency plasma CVD method, a hard carbon coating film (carbon hard decorative coating film) 25 of 2 μm thickness was formed on the internal hardened layer 101 under the following conditions. --

Please replace the paragraph beginning at page 137, line 24, with the following rewritten paragraph:

-- By the removal operation, a three-color band having a portion coated with the TiN coating film 27 and showing a gold color tone, a portion coated with the TiC coating film 36 and showing a white color tone and a portion where the surface of the 1 was exposed outside was obtained, as shown in Fig. 36. Owing to this, the decorative value of the band could be further enhanced. --

Please replace the Abstract of the Disclosure beginning at page 159 with the following rewritten Abstract of the Disclosure:

-- Tableware of Ti or a Ti alloy having a surface ~~hard~~ hardened layer comprising a first hardened layer in which nitrogen and oxygen are diffused so as to form a solid solution and a second hardened layer which is formed in a region deeper than the first hardened layer. The substrate may have a hard decorative

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coating film. A substrate comprising Ti or a Ti alloy has on its surface an internal hardened layer comprising a first hardened layer and a second hardened layer, wherein the hard decorative coating film is formed on the surface of the internal hardened layer. The cutlery comprises a working part and a grip, and the grip is provided with a floating means such as a hollow part. Titanium tableware having excellent long-term mar resistance and high quality appearance ~~quality is provided, and, increasing~~ the decorative value of the tableware can be increased. Further, a process for surface treatment to obtain the titanium tableware with high productivity ~~is provided, as well as and~~ a substrate having a hard decorative coating film, which ~~shows with~~ excellent mar resistance and high surface hardness. ~~Since the cutlery of floats in water, contact of cutlery with one another hardly takes place. Therefore, the cutlery is not marred easily. Moreover, the~~ The cutlery is lightweight, ~~mar-resistant~~ and can be easily handled. --